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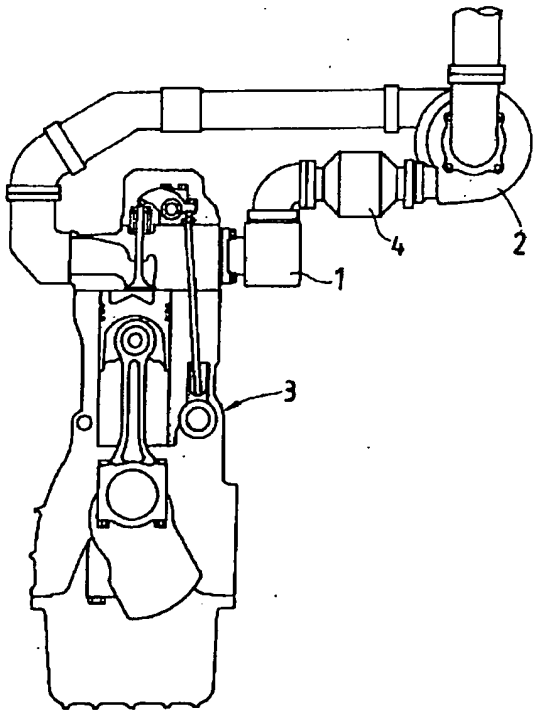
(54)【発明の名称】　還元型脱硝触媒を備えた内燃機関

(57)【要約】
【目的】　還元型の脱硝触媒を用いるものにおいて、この脱硝触媒を最も効率良く機能させる。
【構成】　還元型の脱硝触媒（４）（７）を、その触媒の最大活性温度に合わせて、最も活性の高くなる温度位置に配置する。また、排気ターボ過給機（２）を備えたものでは、その過給機（２）の上流に配置する。



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【特許請求の範囲】

【請求項１】　炭化水素若しくはアルコールを還元剤とする脱硝触媒を備えた内燃機関において、その触媒の最大活性温度に合わせて、排気経路中の最も活性の高い温度位置に前記脱硝触媒を配置したことを特徴とする還元型脱硝触媒を備えた内燃機関。

【請求項２】　排気経路中に排気ターボ過給機を備えたものにおいて、炭化水素若しくはアルコールを還元剤とする前記脱硝触媒をエンジン本体と過給機との間の排気経路中に設けたことを特徴とする還元型脱硝触媒を備えた内燃機関。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は、還元型の触媒を備えた内燃機関に関するものである。

【０００２】

【従来の技術】従来の脱硝装置はアンモニアを還元剤として用いたものであって、一般には、エンジンの排気経路中の後流部分に取付けている。即ち、排気ターボ過給機を備えた機関においては、その排気ターボ過給機よりも後流側において脱硝装置を装備している。排気ガス中のＣＯやＨＣ等を除去するものとしては酸化触媒が用いられているが、これらも一般には排気経路の後流部分に配置されている。

【０００３】

【発明が解決しようとする課題】上記のように、排気ガス中のＮＯx を除去するためには還元型の脱硝触媒を用いることが必要であるが、従来の酸化触媒やアンモニアを用いた脱硝触媒のように、かかる脱硝触媒を排気通路中の後流側に設けたものにおいては、排気温度が低いことから、充分な活性を得られないという欠点がある。即ち、かかる還元型の脱硝触媒は、一般に高温度域に活性化するのが一般であり、このため、排気経路の後流側に配置すると、温度が低いため充分な活性を得られず、脱硝機能が低下する欠点がある。特に、排気経路中に排気ターボ過給機を設けたものにおいては、この過給機によって排気温度が低下することから、その後流側に配置すると効率が非常に落ちるという不都合がある。

【０００４】この発明は、このような欠点を解消して、還元型の脱硝触媒を用いるものにおいて、この脱硝触媒を最も効率良く機能させることを目的とするものである。用いる還元触媒としては、各種ゼオライト系触媒、アルミナ系触媒等が用いられ、常用の使用温度で脱硝性能を有するものであれば特に制限はない。

【０００５】

【課題を解決するための手段】上記の課題を解決するため、この発明では、還元型脱硝触媒を備えた内燃機関において、その還元剤の最大活性温度に合わせて、排気経路中の最も活性の高い温度位置に前記脱硝触媒を配置したことを特徴とする。

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【０００６】同じくこの出願の第２の発明は、排気経路中に排気ターボ過給機を備えたものにおいて、炭化水素若しくはアルコールを触媒とする前記脱硝触媒をエンジン本体と過給機との間の排気経路中に設けたことを特徴とする。

【０００７】

【作用】以上のように、還元型の脱硝触媒をその触媒の活性温度に合わせて、最も活性が高くなる温度位置に配置しているので、触媒の活性を高め、高効率の脱硝作用を持たせることができる。特に、活性温度の高い炭化水素やアルコールを脱硝材とする脱硝触媒を、排気ターボ過給機とエンジンとの間の排気経路中に設けることで、優れた脱硝効果を得ることができる。

【０００８】

【実施例】図１において、（３）はエンジン本体、（１）は、このエンジン本体（３）の排気マニホールドを示しており、その排気マニホールド（１）と排気ターボ過給機（２）との間に、この発明の還元型の脱硝触媒（４）を配置したものである。すなわち、この実施例の触媒（４）は、高温活性化型の炭化水素またはアルコールを還元触媒とするもので、これらの触媒は、通常排気温度400 ～500 度で活性化するものであるところ、排気ターボ過給機の後流では300 度程度しかなく、充分な脱硝作用を得られないのに対し、排気ターボ過給機（２）の上流に設けることで、高い脱硝作用を得ることができるのである。

【０００９】図２は、同じく還元型脱硝触媒（４）を過給機（２）の上流側に縦方向に配置したものにおいて、脱硝装置（４）の出口側と入口側にバイパス弁（６）(6′)を配置して、これらのバイパス弁（６）(6′）間をバイパス回路（５）で結び、排気ガスが低温で触媒（４）の活性が期待できないような場合には、このバイパス弁（６）(6′）を開くことによってバイパス回路（５）側を通過させ、触媒（４）による排気通路の圧力損失を防止できるようにしている。

【００１０】図３は、上記図２のものに更に過給機（２）の後流側に別の触媒（７）を配置して、負荷によって排気温度がその触媒の活性温度よりも高くなり過ぎる場合や、流量が多くて触媒の圧損が大きくなり過ぎるときに、その後流側の触媒（７）に切り換えることができるようにしたものである。すなわち、後流の触媒（７）にもバイパス弁（９）とバイパス通路（８）が設けられ、そのような場合には、上流側のバイパス通路（５）を開き、後流側のバイパス通路（８）を閉じて排気ガスをこの後流の触媒（７）を通すことで、このような問題に対処できるようにしている。

【００１１】更に、図４は、炭化水素以外のアルコール類その他の各種の還元触媒を用いるものにおいて、その各触媒の温度特性即ちその触媒が最も活性化する温度に合わせて、高温域において活性化する触媒（11）を上流

側に低温域で活性化する触媒（12）を下流側にして、広い温度範囲で触媒の活性を図るようしたものである。すなわち、排気通路中に排気ターボ過給機（２）を配置したものにおいて、その過給機（２）の上流に、前記炭化水素のような高温活性型の還元触媒を用いた触媒（11）を配置し、同じく後流側に、比較的低温活性型の還元触媒を用いた触媒（12）を配置し、これによって、広い温度域において高効率の脱硝作用を得ることができる。図５は、その場合の脱硝率を示すもので、比較的低温域における排気温度T_2で活性が最大となる後流側の触媒（12）と、同じく高温域における排気温度T_2で活性が最大となる上流側の触媒（11）とにより、これらを総合して広い温度域で高い脱硝率が得られたものである。

【００１２】図６は、最大活性温度が順次低くなる３種類の触媒（13）～（15）を、その活性温度に合わせて排気通路の上流側から後流側に順次重ねて配置したものを一個の触媒として、排気マニホールド（１）の後部に取り付けたものである。この場合においても、図７で示すように、排気温度が低くなるにしたがって、それにあった触媒（13）～（15）が最大活性能力を発揮するので、広い温度範囲に亙って高い脱硝率を得ることができる。

【００１３】

【発明の効果】以上のように、この発明によれば、その還元型触媒を、その活性温度域に合わせて、排気経路中の最も活性が最大となるような位置に配置していることから、還元型触媒を用いた脱硝装置の機能を最大限に活用できるという効果がある。

【００１４】また、この出願の第２の発明では、炭化水素やアルコールなどの最大活性温度の高い還元触媒を用

いるものにおいて、排気ターボ過給機の上流に触媒を配置するので、過給機出口側の低温の排気を通過させる場合に比較して、遥かに高い脱硝率を得ることができるという効果がある。

【図面の簡単な説明】

【図１】この発明の第１の実施例を示すエンジン全体の概略縦断面図である。

【図２】同じく第２の実施例を示すエンジン全体の概略縦断面図である。

【図３】同じく第３の実施例を示すエンジン全体の概略縦断面図である。

【図４】この発明の第４の実施例を示すエンジン全体の概略縦断面図である。

【図５】上記第４の実施例における排気温度に対する脱硝率の変化を示すグラフである。

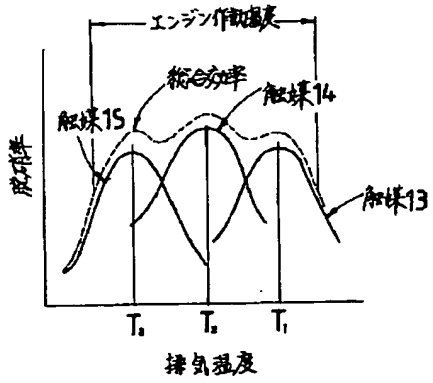
【図６】この発明の第５の実施例を示すエンジン全体の概略縦断面図である。

【図７】上記第５の実施例における排気温度に対する脱硝率の変化を示すグラフである。

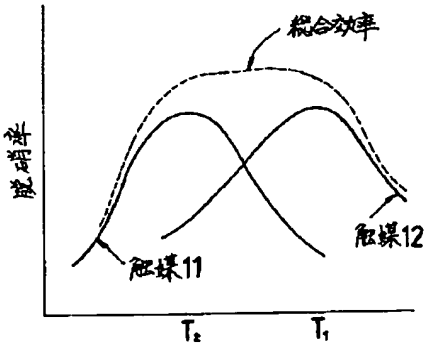
【符号の説明】

（２）　過給機
（３）　エンジン本体
（４）　触媒
（７）　触媒
（11）　触媒
（12）　触媒
（13）　触媒
（14）　触媒
（15）　触媒

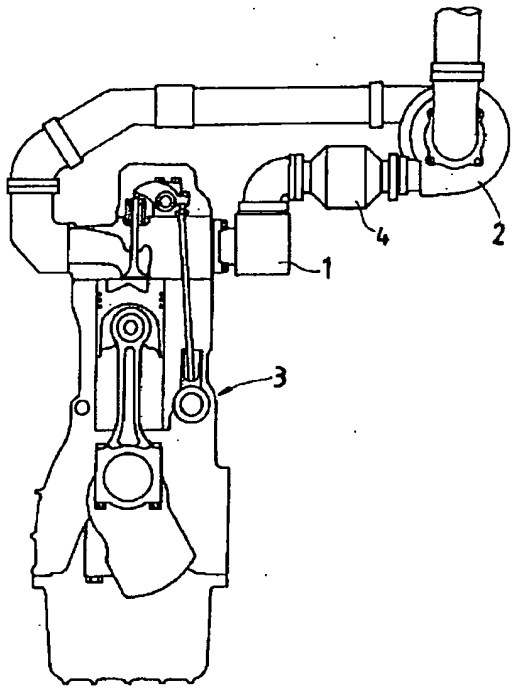
【図７】



【図５】



【図1】



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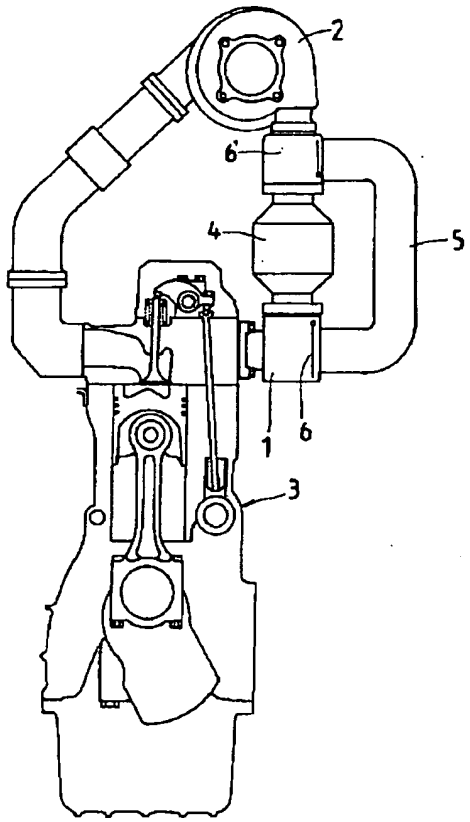

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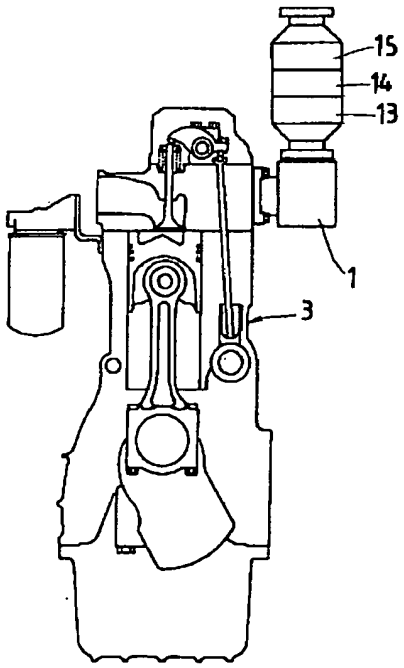

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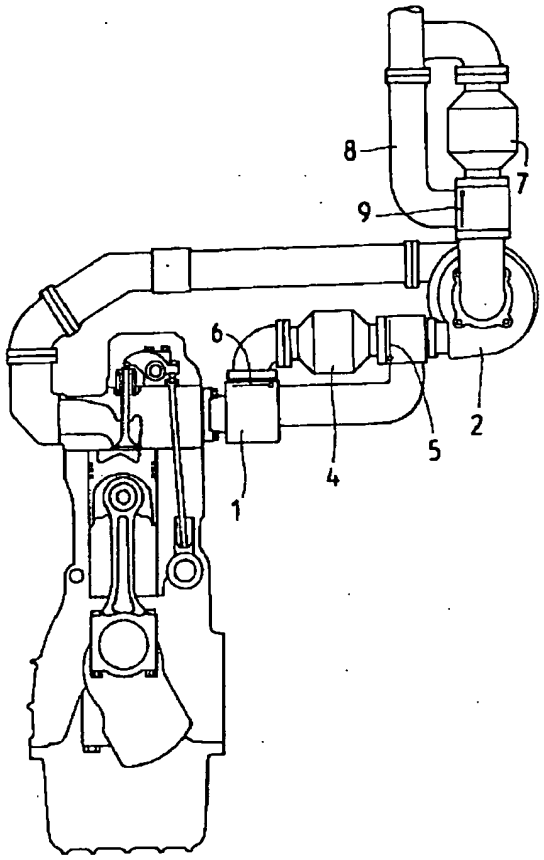
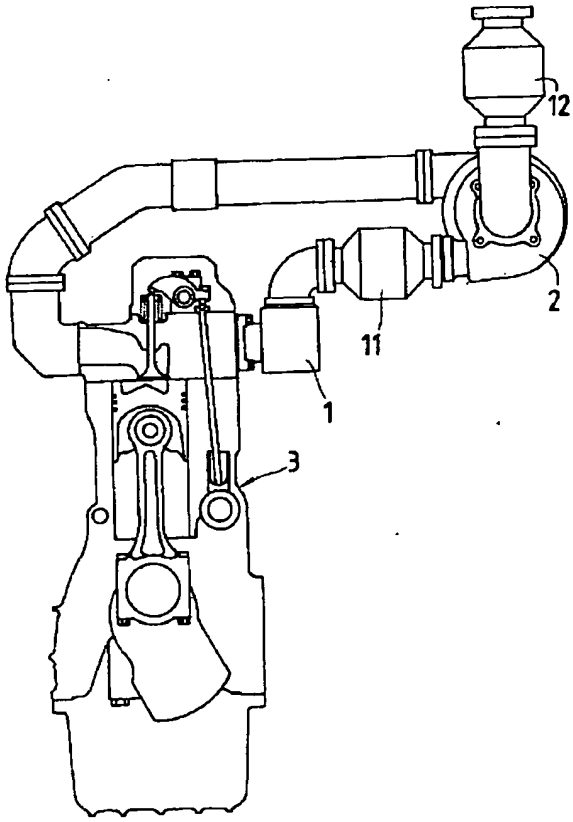


【図4】



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TITLE: INTERNAL COMBUSTION ENGINE EQUIPPED WITH REDUCED TYPE DENITRATION CATALYST

PUBN-DATE: August 23, 1994

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US-CL-CURRENT: **60/282**

ABSTRACT:

PURPOSE: To realize a highly efficient denitration action by either arranging a reduced type denitration catalyst in the position inside an exhaust path where activation of the reducing agent is the highest as matching with the maximum activation temperature of the reduced type, or providing the denitration catalyst between an engine body and a **supercharger** specially for an internal combustion engine provided with a **turbo supercharger**.

CONSTITUTION: A reduced form denitration catalyst 4 is arranged between the exhaust manifold 1 and the exhaust **turbo supercharger** 2 of an engine body 3.
The catalyst 4, which reduces and catalyzes high temperature activating type hydrocarbon or alcohol and because it activates at an **exhaust gas temperature of 400 to 500 degrees,** is provided on the upstream side of the exhaust **turbo supercharger** (about **300** degrees). The exist and the entrance of the denitration device 4 are connected together with a bypass circuit 5 and, when activation of the catalyst 4 is unexpected due to low temperature, bypass valves 6, 6' are opened and the exhaust gas is passed through the bypass circuit 5. Thus function of the denitration device can be utilized to its utmost.

PATENT ABSTRACTS OF JAPAN

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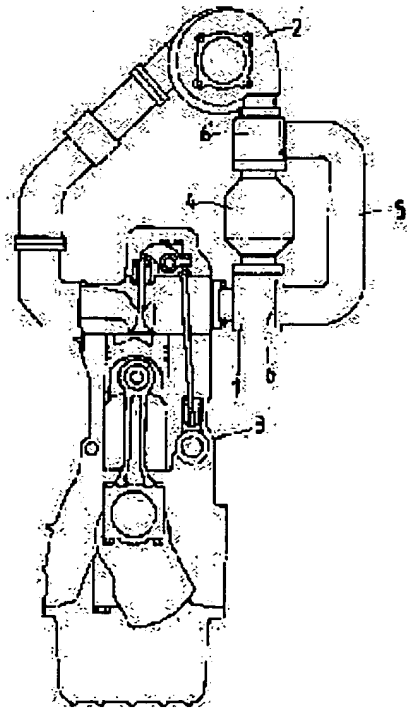
(54) INTERNAL COMBUSTION ENGINE EQUIPPED WITH REDUCED TYPE DENITRATION CATALYST

(57)Abstract:

PURPOSE: To realize a highly efficient denitration action by either arranging a reduced type denitration catalyst in the position inside an exhaust path where activation of the reducing agent is the highest as matching with the maximum activation temperature of the reduced type, or providing the denitration catalyst between an engine body and a supercharger specially for an internal combustion engine provided with a turbo supercharger.

CONSTITUTION: A reduced form denitration catalyst 4 is arranged between the exhaust manifold 1 and the exhaust turbo supercharger 2 of an engine body 3. The catalyst 4, which reduces and catalyzes high temperature activating type hydrocarbon or alcohol and because it activates at an exhaust gas temperature of 400 to 500 degrees, is provided on the upstream side of the exhaust turbo supercharger (about 300 degrees). The exist and the entrance of the denitration device 4 are connected together with a bypass circuit 5 and, when activation of the catalyst 4 is unexpected due to low temperature, bypass valves 6, 6' are opened and the exhaust gas is passed through the bypass circuit 5. Thus function of the denitration device can be utilized to its utmost.



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[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

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CLAIMS

[Claim(s)]
[Claim 1] The internal combustion engine having the reduction type denitrification catalyst characterized by having arranged said denitrification catalyst in the temperature location in an exhaust air path where activity is the highest according to the maximum activity temperature of the catalyst in the internal combustion engine having the denitrification catalyst which uses a hydrocarbon or alcohol as a reducing agent.
[Claim 2] The internal combustion engine having the reduction type denitrification catalyst characterized by establishing said denitrification catalyst which uses a hydrocarbon or alcohol as a reducing agent into the exhaust air path between an engine and a supercharger in what was equipped with the exhaust air turbosupercharger into the exhaust air path.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the internal combustion engine having the catalyst of a reduction type.
[0002]
[Description of the Prior Art] generally the conventional denitrification plant is attached in the back-wash part in an engine exhaust air path, using ammonia as a reducing agent. that is, in the engine having an exhaust air turbosupercharger, the back-wash side is equipped with the denitrification plant rather than the exhaust air turbosupercharger. although the oxidation catalyst is used as what removes CO, HC, etc. in exhaust gas, generally these are also arranged at the back-wash part of an exhaust air path.
[0003]
[Problem(s) to be Solved by the Invention] as mentioned above, NOx in exhaust gas Although it is required to use the denitrification catalyst of a reduction type in order to remove, in what prepared this denitrification catalyst in the back-wash side in a flueway, there is a fault that sufficient activity cannot be acquired from an exhaust-gas temperature being low, like the conventional oxidation catalyst or the denitrification catalyst using ammonia. that is, when being activated in a high temperature region generally is general as for the denitrification catalyst of this reduction type and it is arranged to the back-wash side of an exhaust air path for this reason, since temperature is low, it cannot acquire sufficient activity, but has the fault to which a denitrification function falls. In what prepared the exhaust air turbosupercharger into the exhaust air path especially, since an exhaust-gas temperature falls with this supercharger, when it arranges to an after that style side, there is un-arranging [that effectiveness falls very much].
[0004] This invention cancels such a fault and aims at operating this denitrification catalyst most efficiently in the thing using the denitrification catalyst of a reduction type. As a reduction catalyst to be used, various zeolitic catalysts, an alumina system catalyst, etc. are used, and if it has the denitrification engine performance with service temperature in ordinary use, there will be especially no limit.
[0005]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, in this invention, it is characterized by having arranged said denitrification catalyst in the temperature location in an exhaust air path where activity is the highest in the internal combustion engine having a reduction type denitrification catalyst according to the maximum activity temperature of that reducing agent.
[0006] Similarly invention of the 2nd of this application is characterized by establishing said denitrification catalyst which makes a hydrocarbon or alcohol a catalyst into the exhaust air path between an engine and a supercharger in what was equipped with the exhaust air turbosupercharger into the exhaust air path.
[0007]
[Function] As mentioned above, since it arranges in the temperature location where the denitrification catalyst of a reduction type is doubled with the activity temperature of the catalyst, and activity becomes high most, the activity of a catalyst can be raised and an efficient denitrification operation can be given. The denitrification effectiveness excellent in establishing the denitrification catalyst which makes the high hydrocarbon and the alcohol of activity temperature denitrification material especially into the

exhaust air path between an exhaust air turbosupercharger and an engine can be acquired.
[0008]
[Example] In drawing 1 , (3) shows an engine, (1) shows the exhaust manifold of this engine (3), and the denitrification catalyst (4) of the reduction type of this invention is arranged between that exhaust manifold (1) and exhaust air turbosupercharger (2). namely, the thing to which the catalyst (4) of this example makes a reduction catalyst the hydrocarbon or the alcohol of an elevated-temperature activation mold -- it is -- these catalysts -- usually -- exhaust-gas temperature 400-500 the place which is what is activated by whenever -- the back wash of an exhaust-air turbosupercharger -- 300 whenever -- extent -- there is nothing -- sufficient denitrification operation -- obtaining -- not having -- a thing -- receiving -- an exhaust-air turbosupercharger -- (-- the high denitrification operation can be acquired by preparing in the upstream of 2).
[0009] In that to which drawing 2 has similarly arranged the reduction type denitrification catalyst (4) to the upstream of a supercharger (2) in the lengthwise direction A bypass valve (6) and (6') are arranged to the outlet side and entrance side of a denitrification plant (4). These bypass valves (6) (6') When an epilogue and exhaust gas cannot expect the activity of a catalyst (4) at low temperature in a bypass circuit (5), between This bypass valve (6) (6') A bypass circuit (5) side is passed and it enables it to prevent the pressure loss of the flueway by the catalyst (4) by opening.
[0010] drawing 3 arranges still more nearly another catalyst (7) to the back-wash side of a supercharger (2) to the thing of above-mentioned drawing 2 , and when an exhaust-gas temperature becomes higher than the activity temperature of the catalyst too much with a load, when there are many flow rates and the pressure loss of a catalyst becomes large too much, it enables it to switch it to the catalyst by the side of an after that style (7) that is, a bypass valve (9) and a bypass path (8) are established in the catalyst (7) of back wash, in such a case, the bypass path (5) of the upstream is opened, the bypass path by the side of back wash (8) is closed, and it enables it to cope with such a problem by letting the catalyst (7) of this back wash pass in exhaust gas
[0011] Furthermore, in the thing using various kinds of reduction catalysts of the alcohols and others other than a hydrocarbon, drawing 4 makes the downstream the catalyst (12) which activates to the upstream the catalyst (11) activated in a pyrosphere in a low-temperature region according to the temperature which the temperature characteristic of each of that catalyst, i.e., the catalyst, activates most, and carries out it as [plan / in a large temperature requirement / activity of a catalyst]. that is, in what has arranged the exhaust air turbosupercharger (2) all over a flueway, the catalyst (11) which used the reduction catalyst of an elevated-temperature active type like said hydrocarbon for the upstream of the supercharger (2) is arranged, similarly, the catalyst (12) which used the reduction catalyst of a low-temperature active type comparatively at the back-wash side can be arranged, and an efficient denitrification operation can be acquired in a large temperature region by this. exhaust-gas temperature [in / comparatively / drawing 5 R> 5 shows the rate of denitrification in that case, and / a low-temperature region] T2 Exhaust-gas temperature [in / as well as the catalyst by the side of the back wash from which activity serves as max (12) / a pyrosphere] T2 According to the catalyst (11) of the upstream from which activity serves as max, these are synthesized and the high rate of denitrification is obtained in a large temperature region.
[0012] drawing 6 attaches in the posterior part of an exhaust manifold (1) as a catalyst of a piece what doubled with the activity temperature catalyst (13) - (15) which is three kinds to which the maximum activity temperature becomes low one by one, and has arranged it from the upstream of a flueway in piles one by one to the back-wash side. Also in this case, since catalyst (13) - (15) which suited it demonstrates the maximum activity capacity as drawing 7 shows, and an exhaust-gas temperature becomes low, a large temperature requirement can be covered and the high rate of denitrification can be obtained.
[0013]
[Effect of the Invention] As mentioned above, according to this invention, since that reduction type catalyst was doubled with that activity temperature region and arranged in a location in an exhaust air path where activity serves as max most, it is effective in the function of the denitrification plant using a reduction type catalyst being utilizable for the maximum.
[0014] Moreover, in invention of the 2nd of this application, in the thing using a reduction catalyst with the high maximum activity temperature, such as a hydrocarbon and alcohol, since a catalyst is arranged

for the upstream of an exhaust air turbosupercharger, as compared with the case where exhaust air of the low temperature of a supercharger outlet side is passed, it is effective in the ability to obtain the far high rate of denitrification.

[Translation done.]